CLAIMS

1. A method of producing a semiconductor device, including:

a step of depositing organic-based interlayer insulation films (4, 6);

a step of forming an opening portion on the organic-based interlayer insulation films (4, 6); and

a step of performing silylation to reform a wall surface portion of the organic-based interlayer insulation films (4, 6) exposed in said opening portion.

2. The method of producing a semiconductor device according to claim 1, characterized by further including a step of forming protective layers (4b, 6b) including an inorganic-based insulation material on a surface of said opening portion wall surface subjected to silylation.

3. The method of producing a semiconductor device according to claim 2, characterized by the inner wall surface of said opening portion, including silylated molecules as a result of silylation, being exposed to oxide plasma to form a silicon oxide film for protecting the inner wall of the opening portion in a step of forming said protective films (4b, 6b).

4. The method of producing a semiconductor

device according to claim 1, characterized by further including a step of forming an organic-based substance in a state of being formed with said opening portion and removing the organic-based substance at least from said opening portion after said silylation.

5. The method of producing a semiconductor device according to claim 4, characterized by

said opening portion comprising a via hole (VH) formed by penetrating two interlayer insulation films (4, 6) in a dual-damascene wiring process and

a step of forming a wiring trench (CG) connected to said via hole (VH) on an upper interlayer insulation film (6) of said two interlayer insulation films (4, 6) through the steps of coating a photo resist (R) and performing exposure and development in a state of being formed with the via hole (VH) being further included.

6. The method of producing a semiconductor device according to claim 5, characterized by further including a step of forming an etching stopper film (5) for protecting a via hole (VH) on a lower interlayer insulation film (4) of said two interlayer insulation films (4, 6) in advance between said two interlayer insulation films (4, 6) when etching for forming said wiring trench (CG).

7. The method of producing a semiconductor device according to claim 6, characterized by said etching stopper film (5) comprising a silicon nitride film.

8. The method of producing a semiconductor device according to claim 5, characterized by at least said upper-layer interlayer insulation film (6) formed with said wiring trench (CG) of said two interlayer insulation films (4, 6) including an organic-based insulation material.

9. The method of producing a semiconductor device according to claim 8, characterized by said organic-based insulation material being any one of a methyl group-containing SiO_2 film, a polyimide-based polymer film, a parylene-based polymer film, a Teflon (registered trademark)-based polymer film, a polyarylether-based polymer film and an amorphous carbon film doped with fluorine.

10. The method of producing a semiconductor device according to claim 1, characterized by forming a porous organic insulation film as said organic-based interlayer insulation films (4, 6).

11. A method of producing a semiconductor device including a step of forming an opening portion on organic-based interlayer insulation films (4, 6),

including:

a step of depositing organic-based interlayer insulation films (4, 6) containing a silylating agent;

a step of forming an opening portion on the organic-based interlayer insulation films (4, 6); and

a step of forming protective layers (4b, 6b) comprising an inorganic-based interlayer insulation material on an inner wall surface of said opening portion containing a silylating agent.

12. The method of producing a semiconductor device according to claim 11, characterized by said protective film comprising silicon oxide.

13. The method of producing a semiconductor device according to claim 11, characterized by a silicon-oxide film for protecting an inner wall surface of the opening portion being formed by exposing the inner wall surface of said opening portion containing a silylating agent to oxygen plasma in a step of forming said protective films (4b, 6b).

14. A semiconductor device, comprising two organic-based interlayer insulation films (4, 6) stacked on top of another, wherein a via hole (VH) is formed on a lower-layer interlayer insulation film (4) and a wiring trench (CG) connected to said via hole (VH) is formed on an upper layer interlayer insulation film (6) of the two

organic-based interlayer insulation films (4, 6), and having a wiring configuration in which a conductive material (9, 10) is buried in the wiring trench (CG) and said via hole (VH); wherein

an inner-wall portion of said via hole (VH) of a lower-layer interlayer insulation film (4) of said two interlayer insulation films (4, 6) is provided with a silylated molecules containing layer (4a) and a protective layer (4b) and includes an inorganic-based insulation substance formed on a via hole (VH) inner wall surface portion of the silylated molecules containing layer (4a).

15. The semiconductor device according to claim 14, characterized by said protective layer (4b) comprising silicon oxide.

16. The semiconductor device according to claim 14, characterized by said opening portion comprising a via hole (VH) formed by penetrating two interlayer insulation films (4, 6) in a dual-damascene wiring process.

17. The semiconductor device according to claim 14, characterized by an etching stopper film (5) for protecting a via hole (VH) of a lower-layer interlayer insulation film (4) of said two interlayer insulation films (4, 6) being formed between said two interlayer

insulation films (4, 6).

18. The semiconductor device according to claim 14, characterized by said etching stopper film (5) comprising a silicon nitride film.

19. The semiconductor device according to claim 14, characterized by an organic-based insulation material composing said two interlayer insulation films (4, 6) being any one of a methyl group-containing SiO_2 film, a polyimide-based polymer film, a parylene-based polymer film, a Teflon (registered trademark)-based polymer film, a polyarylether-based polymer film and an amorphous carbon film doped with fluorine.

20. The semiconductor device according to claim 14, characterized by said two organic-based interlayer insulation films (4, 6) comprising a porous organic insulation film.